



Appl. No. 10/675,126  
HSJ920030026US2/(HITG.053-0522)  
Amdt. Dated April 20, 2006  
Reply to Office Action of January 31, 2006

### In the Claims

The following is a complete listing of the claims and replace all prior claims in the application:

1. (Currently Amended) A method of forming a spin valve sensor, comprising:
  2. forming a ferromagnetic free layer structure that has a magnetic moment;
  3. forming a ferromagnetic pinned layer structure having a magnetic moment;
  4. forming a nonmagnetic conductive spacer layer between the free layer structure and the pinned layer structure;
  5. forming an anti-ferromagnetic pinning layer coupled to the pinned layer structure for pinning the magnetic moment of the pinned layer structure;
  6. forming hard magnetic thin films on both sides of at least a portion of the free layer structure, the ferromagnetic pinned layer structure, the nonmagnetic conductive spacer layer and the anti-ferromagnetic pinning layer; and
  7. forming a hard bias seedlayer structure adjacent to and on opposite sides of at least a portion of the free layer structure, the ferromagnetic pinned layer structure, the nonmagnetic conductive spacer layer and the anti-ferromagnetic pinning layer, wherein the forming the hard bias seedlayer structure comprises forming at least a first layer comprising silicon and a second layer comprising chromium or chromium molybdenum.
2. (Original) The method of claim 1, wherein the forming the anti-ferromagnetic pinning layer further comprising forming a layer of platinum manganese.

1           3. (Original)   The method of claim 1, wherein the forming the hard bias  
2    seedlayer structure further comprises forming a layer of tantalum adjacent the silicon layer.

1           4. (Original)   The method of claim 3, wherein the forming a layer of tantalum  
2    adjacent the silicon layer further comprises forming the tantalum and silicon layer with equal  
3    thickness.

1           5. (Original)   The method of claim 3, wherein the forming a layer of tantalum  
2    adjacent the silicon layer further comprises forming the tantalum layer with a thickness half a  
3    thickness of the silicon layer.

1           6. (Original)   The method of claim 3, wherein the forming a layer of tantalum  
2    further comprises forming a tantalum-chromium alloy layer.

1           7. (Original)   The method of claim 6, wherein the forming the tantalum-  
2    chromium alloy layer further comprises forming the tantalum-chromium alloy layer and the  
3    silicon layer with equal thickness.

1           8. (Original)   The method of claim 6, wherein the forming the tantalum-  
2    chromium alloy layer further comprises forming the tantalum-chromium alloy layer with a  
3    thickness half a thickness of the silicon layer.

1           9. (Currently Amended) The method of claim 1, wherein the forming the hard  
2       bias seedlayer structure further comprises forming at opposite sides of at least a portion of the  
3       free layer structure, the ferromagnetic pinned layer structure, the nonmagnetic conductive  
4       spacer layer and the anti-ferromagnetic pinning layer, a first layer of tantalum, a second layer  
5       of silicon and a third layer comprising chromium.

1           10. (Currently Amended) The method of claim 1, wherein the forming the hard  
2       bias seedlayer structure further comprises forming at opposite sides of at least a portion of the  
3       free layer structure, the ferromagnetic pinned layer structure, the nonmagnetic conductive  
4       spacer layer and the anti-ferromagnetic pinning layer, a first layer of tantalum, a second layer  
5       of silicon and a third layer comprising chromium-molybdenum.

1           11. (Currently Amended) A method of forming a spin valve sensor, comprising:  
2       forming a spin valve structure including a ferromagnetic free layer, a ferromagnetic  
3       pinned layer and an anti- ferromagnetic pinning layer;  
4       forming hard magnetic thin films adjacent at least a portion of the spin valve structure  
5       on both sides of the spin valve structure; and  
6       forming a hard bias seedlayer structure adjacent to and on opposite sides of at least a  
7       portion of the spin valve structure, wherein the forming the hard bias seedlayer structure  
8       comprises forming at least a first layer comprising silicon and a second layer comprising  
9       chromium or chromium molybdenum.

1           12. (Original)   The method of claim 10, wherein the pinning layer comprises  
2   platinum manganese.

1           13. (Original)   The method of claim 10, wherein the forming the hard bias  
2   seedlayer structure further comprises forming a layer of tantalum adjacent the silicon layer.

1           14. (Original)   The method of claim 13, wherein the forming a layer of  
2   tantalum adjacent the silicon layer further comprises forming the tantalum and silicon layer  
3   with equal thickness.

1           15. (Original)   The method of claim 13, wherein the forming a layer of  
2   tantalum adjacent the silicon layer further comprises forming the tantalum layer with a  
3   thickness half a thickness of the silicon layer.

1           16. (Original)   The method of claim 13, wherein the forming a layer of  
2   tantalum further comprises forming a tantalum-chromium alloy layer.

1           17. (Original)   The method of claim 16, wherein the forming the tantalum-  
2   chromium alloy layer further comprises forming the tantalum-chromium alloy layer and the  
3   silicon layer with equal thickness.

1           18. (Original)   The method of claim 16, wherein the forming the tantalum-  
2   chromium alloy layer further comprises forming the tantalum-chromium alloy layer with a  
3   thickness half a thickness of the silicon layer.

1           19. (Currently Amended) The method of claim 11, wherein the forming the hard  
2       bias seedlayer structure further comprises forming at opposite sides of at least a portion of the  
3       free layer structure, the ferromagnetic pinned layer structure, the nonmagnetic conductive  
4       spacer layer and the anti-ferromagnetic pinning layer, a first layer of tantalum, a second layer  
5       of silicon and a third layer comprising chromium.

1           20. (Currently Amended) The method of claim 11, wherein the forming the hard  
2       bias seedlayer structure further comprises forming at opposite sides of at least a portion of the  
3       free layer structure, the ferromagnetic pinned layer structure, the nonmagnetic conductive  
4       spacer layer and the anti-ferromagnetic pinning layer, a first layer of tantalum, a second layer  
5       of silicon and a third layer comprising chromium-molybdenum.

1           21. (Currently Amended) A method of forming a hard bias seedlayer structure,  
2       comprising:

3           forming a first layer comprising silicon adjacent to and on opposite sides of a spin  
4       valve structure; and  
5           forming a second layer comprising chromium or chromium molybdenum adjacent to  
6       the first layer.

1           22. (Original)     The method of claim 21 further comprising forming a layer of  
2       tantalum adjacent the silicon layer.